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**Characterization of human amniotic fluid stem cells and their pluripotential capability.**

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**Public Summary:**

Over the past decade, there has been ever-increasing emphasis placed on stem cells and their potential role in regenerative medicine for reconstruction of bio-artificial tissues and organs. Scientists have looked at various sources for pluripotential cells ranging from embryonic stem cells to adult stem cells. Amniocentesis is a well-established technique for the collection of cells derived from the human embryo. In this chapter, we are going to describe how to isolate, maintain in culture, and characterize the pluripotential capabilities of stem cells derived from amniocentesis in an in vitro and in vivo system. Cell samples are obtained from human pregnancies, and the progenitor cells are isolated from male fetuses with a normal karyotype in order to confirm the absence of maternal admixed cells. Progenitor cells express embryonic-specific cell markers, they show a high self-renewal capacity with 350 population doublings, and normal ploidy is confirmed by cell-cycle analyses. They maintain their undifferentiated state, pluripotential ability, clonogenicity, and telomere length over the population doublings. The progenitor cells are inducible to different cell lineages (osteogenic, adipogenic, skeletal muscle, endothelial, neuronal, and hepatic cells) under specific growth conditions. The ability to induce cell-type-specific differentiation is confirmed by phenotypic changes, immunocytochemistry, gene expression, and functional analyses. In addition, we will describe an application of these cells in an ex vivo and in vivo system for potential in organ (renal) regeneration. The progenitor cells described in this chapter have a high potential for expansion, and may be a good source for research and therapeutic applications where large numbers of cells are needed. Progenitor cells isolated during gestation may be beneficial for fetuses diagnosed with malformations and could be cryopreserved for future self-use.

**Scientific Abstract:**

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